9-30-2021

Impact of the COVID-19 outbreak on tourists' real-time on-site emotional experience in reopened tourism destinations

Yang Yang

Qian Ruan

Songshan (Sam) Huang
Edith Cowan University

Tian Lan

Ying Wang

10.1016/j.jhtm.2021.07.014
This is an author's accepted manuscript of: Yang, Y., Ruan, Q., Huang, S. S., Lan, T., & Wang, Y. (2021). Impact of the COVID-19 outbreak on tourists' real-time on-site emotional experience in reopened tourism destinations. *Journal of Hospitality and Tourism Management, 48,* 390-394.
https://doi.org/10.1016/j.jhtm.2021.07.014

Impact of the COVID-19 Outbreak on Tourists' Real-time On-site Emotional Experience in Reopened Tourism Destinations

Abstract:

The COVID-19 pandemic that caused unprecedented havoc on global tourism industry will all blow over, however whether the tourists' real-time on-site emotional experience in the reopened tourism destinations is higher or lower than that of the period before the pandemic outbreak has not been studied. Since this is an important basis for managers to design tourist win-back strategies, this study empirically examines the impact of the COVID-19 outbreak on tourists' real-time on-site emotional experience using geo-tagged check-in user-generated content data in China's National 5A scenic spots from November 7, 2019 to April 8, 2020. Results show that although the COVID-19 pandemic doesn't destroy the tourist attractions, tourists' real-time on-site emotional experience after the outbreak of COVID-19 is significantly lower than that of the period before the COVID-19 outbreak, suggesting that tourism destinations should not only focus on the recovery of tourist arrivals, but also pay attention to the tourist experience recovery during the tourism recovery stage. Results also provide empirical evidence and practical implications for destinations in tourist experience management during and after the COVID-19 pandemic.

Keywords: COVID-19 outbreak; Real-time on-site emotional experience; Sentiment analysis; Reopened tourism destinations

1. Introduction

The COVID-19 pandemic is confirmed in almost every country or territory around the world (World Health Organization, 2020), and has significantly disrupted the tourism industry (Polyzos, Samitas, & Spyridou, 2020). It is widely accepted that the world will not return to its pre-pandemic normalcy unless the safe and effective vaccines are available and a global vaccination programme is successfully implemented (WHO, 2020). What's more, the 100% safe and efficacious vaccine is still a few years away from global mass immunization (Jeyanathan et al., 2020), resulting in the normalized pandemic prevention and control (Zwanka & Buff, 2020); therefore, the

tourism industry may still live with the COVID-19 pandemic for a long time. Many countries struck by the COVID-19 pandemic have introduced physical-distancing strategies to slow down the spread of the virus, unwillingly causing economic depression and even social instability (Yoosefi Lebni et al., 2020; Nicola et al., 2020). To balance pandemic prevention and economic stability, many tourism destinations have reopened to tourists under necessary pandemic control measures. Especially, countries like China are easing restrictions while watching for flare-ups. By March 16, 2020, 3,714 nationally certified tourism scenic spots have reopened in China (Ministry of Culture and Tourism of the People's Republic of China, 2020). Considering the fact that the COVID-19 pandemic does not destroy the tourist attractions that trigger tourists' experience, is the tourists' real-time on-site emotional experience in the reopened tourism area higher or lower than that of the period before the pandemic outbreak?

For tourists who have been quarantined for a long time, reentering into the reopened tourism destinations may create more exciting tourism experience; however, the psychological shadow caused by the COVID-19 pandemic may lower tourists' real-time on-site emotional experience. Thus, it is necessary for tourism managers to know how tourists' real-time on-site emotional experience changes pre and post the COVID-19 outbreak and take corresponding measures. For example, if COVID-19 did lower tourists' real-time on-site emotional experience, tourism managers can take actions like providing more tourism services or lowering the price to enhance tourist experience. Otherwise, they should adopt opposite strategies.

In theory, tourism is often regarded as a pleasure-seeking experience (Goossens, 2000), and emotion is a core component of tourist experience (Mcintosh & Siggs, 2005). Tourist emotions can be determined by destinations' physical environment (McKercher, Shoval, Park, & Kahani, 2015; Zhang, Hou, Li, & Huang, 2020). Therefore, understanding tourists' emotional experience in the reopened tourism destinations is critical to tourism industry in the post-disaster tourism recovery period. It is suspected that the COVID-19 pandemic may cause negative emotions. First, according to stress theory (Schaller, Murray, & Bangerter, 2015) and perceived risk theory (Slovic, 1987), public health emergencies trigger more negative emotions (Li, Wang, Xue, Zhao, & Zhu, 2020). Second, due to the pandemic, the tour time in many tourism destinations have been shortened and many activities have been cancelled, which may reduce individual' s sense of joy (Liu, Sparks, & Coghlan, 2016). Finally, wearing masks while traveling may also weaken tourists' emotional experience, as tourists' emotional

experience is intricately linked to some sensory stimuli (Matteucci, 2016). However, positive emotions may also be evoked by the reopening of outdoor tourism destinations, as it enables tourists to have close contact with the natural environment, and thus brings satisfaction of vision, hearing and smell, and evokes special emotions (Buckley & Westaway, 2020; Zhang & Xu, 2020). Although studies have concerned the impact of the COVID-19 pandemic on tourism (Polyzos et al., 2020; Yang, Zhang, & Chen, 2020), limited attention has been paid on tourists' real-time on-site emotional experience, and the question about how tourists' real-time on-site emotional experience changes pre and post the COVID-19 outbreak has not been answered empirically. Therefore, we aim to address this gap by using geo-tagged check-in user-generated content (UGC) data in China's National 5A scenic spots.

2. Data and methodology

Existing studies mainly used questionnaires (Prayag, Hosany, & Odeh, 2013; Ma, Scott, Gao, & Ding, 2017) or interviews (Moal-Ulvoas, 2017) to measure tourists' emotional experience, which can only capture tourists' remembered experience but not the real-time on-site emotional experience. To overcome this limitation, following Zheng, Wang, Sun, Zhang, and Kahn (2019), we applied UGC semantic analysis to measure tourists' emotional experience expressed on check-in pages on social media.

Since the pandemic situation in China was better under control, tourists' geo-tagged check-in UGC data were collected from Sina Weibo, the most popular microblogging platform in China, to test the impact of the COVID-19 outbreak on tourists' emotional experience during the pandemic. The check-in Weibo posts record the users' location information when posting Weibo in a certain location, and are listed in the check-in homepages of this location. Web crawler technology was used to get real-time on-site content generated by tourists during their trips. China's National 5A scenic spots were chosen in our study. By August 1, 2020, a total of 280 scenic spots had been certificated as China's National 5A scenic spots. After eliminating the scenic spots without a Weibo check-in homepage and consolidating those with multiple homepages, Weibo check-in data from 241 check-in homepages were analyzed. The Weibo check-in posts were collected from January 23, 2020 to April 8, 2020 (77 days) which is after the Wuhan lockdown (January 23, 2020), and November 7, 2019 to January 22, 2020 (77 days) which is before the Wuhan lockdown, to make the temporal

interval balance. Due to the limitation of Sina Weibo's application programming interface (API), only Weibo posts listed in the latest 150 pages of each check-in homepage can be collected. Finally, we collected 67,827 Weibo check-in posts during our study period.

2.1 Dependent variable

The median sentiment index for a scenic spot on a given day was used to reflect tourist overall emotional experience in this scenic spot on the day (Zheng et al., 2019). We used the following steps to get the median sentiment index: (1) Weibo posts less than 15 Chinese characters and advertisements were excluded, as those posts cannot effectively reveal the emotional tendency of tourists. After the exclusion, 56,026 valid Weibo check-in posts were kept for analysis. As shown in Table 1, the volume of Weibo check-in posts in each month is between 5000 and 15000, and the volume of scenic spots in each month is around 200. Also, the sample sizes before and after the Wuhan lockdown (January 23, 2020) are very close. Specifically, there are 28,259 valid Weibo check-in posts between November 7, 2019 and January 22, 2020, and 27,767 valid posts between January 23, 2020 and April 8, 2020. Considering that the whole dataset except invalid samples was used, it is sufficient to demonstrate the impact of the COVID-19 outbreak on tourists' real-time on-site emotional experience. (2) Sentiment analysis was conducted to get sentiment scores using the sentiment tendency analysis service from Tencent natural language processing (NLP) platform which is the mainstream NLP platform to process Chinese text. The Tencent sentiment analysis was performed using the predefined Long Short-Term Memory (LSTM) and Bidirectional Encoder Representations from Transformers (BERT) models based on Tencent' s large Chinese corpus. The sentiment scores extracted by Tencent sentiment analysis range from 0 to 1, and were multiplied 100 (Zheng et al., 2019), with 0 representing a strongly negative sentiment, 100 representing a strongly positive sentiment and 50 representing a neutral sentiment. (3) All Weibo posts were collapsed into a specific scenic spot/day-level, and the median sentiment index was constructed by calculating the median sentiment value of all Weibo check-in posts at a scenic spot on a given day. Finally, a total of 16,791 observations were generated.

<Insert Table 1 here >

2.2 Independent variables

The COVID-19 outbreak in the scenic spot was measured from two perspectives. The first was whether there is a COVID-19 outbreak. The date of the Wuhan lockdown (January 23, 2020) was used as the indicator of the COVID-19 outbreak in China. Thus, a dummy variable named *OUTBREAK* was created to measure whether there is an outbreak, with 1 representing the COVID-19 outbreak and 0 representing no COVID-19 outbreak. The second was measured by the response level to public health emergencies in the province where the scenic spot is located. In China, public health emergencies are classified into four levels: 1st, 2nd, 3rd and 4th (Chinese Center for Disease Control and Prevention, 2018), with smaller numbers indicating more serious emergencies. The response level to public health emergencies refers to the different measures taken at different levels of public health emergencies. The first level response is the highest-level response, referring to the emergency work organized and coordinated by provincial governments under the command of the State Council in the first level public health emergency. After the COVID-19 outbreak, 31 provinces and regions in China have successively launched the first level response to the COVID-19 pandemic. With the effective control of the pandemic, by April 8, 2020, most provinces and regions have downgraded the first level response to the second level response or the third level response. Thus, the response level was used as another proxy to measure the COVID-19 pandemic situation, named *RESPONSELEVEL.* Since the smaller number of the response level indicates the more serious emergency, this variable was coded reversely, with 0 representing no response, 1 representing the fourth level response, 2 representing the third level response, 3 representing the second level response, and 4 representing the first level response. The COVID-19 pandemic data was obtained from the provincial Health and Construction Commission.

2.3 Control variables

Time distance, holidays, temperature and scenic spot were included as control variables. First, after a public health emergency breaks out, time course can alleviate people's psychological symptoms (Su, Ye, Zhang, & Lin, 2020). Thus, time distance (*TIMEDISTANCE*) measured by the number of days from January 23, 2020 (the Wuhan lockdown) was included in our model. Second, people may be happier on weekends and holidays (Zheng et al., 2019). Thus, a dummy variable named *HOLIDAY* was used

to control the impact of weekends and holidays. Third, temperature (*TEMPERATURE*) was considered in our model because it may affect tourist perception and experience (Becken, 2013; Denstadli & Jacobsen, 2014). The temperature data was collected from the 911 weather query website (https://tianqi.911cha.com), a widely used weather query website in China. Finally, a dummy variable named *SPOT* was used to control the scenic spot fixed effect, as it can reflect some omitted factors like the characteristics and heterogeneity of scenic spots. All variables used in this study are listed in Table 2.

<Insert Table 2 here >

2.4 Model specification

Three OLS regression models are specified as below:

$$SENTIMENT_{it} = \beta_0 + \beta_1 OUTBREAK_{it}/RESPONSELEVEL_{it} + \varepsilon_{it} \quad (1)$$

where, i = 1,……,N denotes the scenic spot, t = 1,……,T denotes the date. $OUTBREAK_{it}$ *and* $RESPONSELEVEL_{it}$ are tested alternatively. $OUTBREAK_{it}$ refers to whether Wuhan has been lockdown on date t, $RESPONSELEVEL_{it}$ represents the response level to the COVID-19 pandemic at scenic spot i on date t. $SENTIMENT_{it}$ indicates the median sentiment index of scenic spot i on date t. The parameter β_0 is the intercept term, and the parameter β_1 is the regression coefficient of interest. We conjectured that β_1 would be significantly negative, that is, the COVID-19 outbreak has a negative impact on tourists' real-time on-site emotional experience.

Next, three control variables are included in the base model as below:

$$SENTIMENT_{it} = \beta_0 + \beta_1 OUTBREAK_{it}/RESPONSELEVEL_{it} + \beta_2 TIMEDISTANCE_{it} + \beta_3 HOLIDAY_{it} + \beta_4 TEMPERATURE_{it} + \varepsilon_{it} \quad (2)$$

Finally, $SPOT_i$ is added to control the scenic spot fixed effect in our model:

$$SENTIMENT_{it} = \beta_0 + \beta_1 OUTBREAK_{it}/RESPONSELEVEL_{it} + \beta_2 TIMEDISTANCE_{it} + \beta_3 HOLIDAY_{it} + \beta_4 TEMPERATURE_{it} + \Pi SPOT_i + \varepsilon_{it} \quad (3)$$

where, Π is the scenic spot fixed effect.

3. Results

As shown in Table 3, *OUTBREAK* is significantly and negatively associated with the median sentiment index, suggesting that tourists' emotional experience after the

COVID-19 outbreak is lower than that of the period without COVID-19. Also, the *RESPONSELEVEL* has a significant negative correlation with the median sentiment index, indicating that the COVID-19 outbreak had a negative impact on tourists' emotional experience. These results are consistent with our conjecture. As for the control variables, time distance (*TIMEDISTANCE*), temperature (*TEMPERATURE)* and holidays (*HOLIDAY)* all have positive and significant effects on tourists' emotional experience. Tourists' emotional experience varies in different tourist scenic spots, showing that tourists' emotional experience is significantly affected by tourism destinations.

< Insert Table 3 here >

4. Robustness Checks

Since Sina Weibo's application programming interface (API) only allows access to the Weibo posts listed in the latest 150 pages of each check-in homepage, the time interval of some scenic spots may not cover the complete period from November 7, 2019 to April 8, 2020, resulting in unbalanced period in same scenic spots. Therefore, we excluded the unbalanced scenic spots in the perspective of time interval, got 183 scenic spots with 15,895 valid observations which had been collapsed into scenic spot/day-level, and reestimated the model 1-3. As shown in Table 4, the results are robust in line with Table 3.

< Insert Table 4 here >

As for the robustness of the dependent variable, the sentiment score for each Weibo post was recalculated using BaiduAI, another mainstream NLP platform to process Chinese text. Different from the Tencent sentiment analysis technique, the Baidu sentiment analysis was performed using the Bi-directional Long Short-Term Memory (BI-LSTM) based on Baidu big data. The sentiment scores were also multiplied by 100 and collapsed into scenic spot/day level based on the median value. After replacing the dependent variable, data was reanalyzed with all else being equal. As shown in Table 5, the coefficients of the variables *OUTBREAK* and *RESPONSELEVEL* are still significant and negative.

< Insert Table 5 here >

In addition, both Baidu and Tencent NLP platform will label each Weibo post with

a clear sentiment tendency (positive or negative). We found that 7,765 Weibo posts (13.9% of the Weibo posts) had opposite sentiment tendencies. That is, for one post, one platform may give a positive label, while the other may give a negative. Therefore, Weibo posts with opposite sentiment tendencies were eliminated, and median sentiment indexes calculated by sentiment scores from Tencent and Baidu NLP platform were separately used as dependent variables. Results are shown in Table 6 and Table 7 respectively. Still, the COVID-19 outbreak shows a negative and significant relationship with tourists' emotional experience, confirming the robustness of our findings.

< Insert Table 6 here >

< Insert Table 7 here >

5. Conclusion

Many tourism destinations that were impacted by the COVID-19 pandemic are reopened, however whether the tourists' real-time on-site emotional experience in the reopened tourism destinations is higher or lower than that of the period before the pandemic outbreak has not been studied. To address this gap, online UGC sentiment analysis method was used to measure tourists' expressed emotional experience based on geo-tagged check-in UGC data in China's National 5A scenic spots from November 7, 2019 to April 8, 2020. Intuitively, the COVID-19 pandemic does not destroy the tourist attractions that trigger tourists' experience, hence the tourists' real-time on-site emotional experience should not change when the tourism destinations reopened. However, findings show that the COVID-19 outbreak indeed has a negative impact on tourists' real-time on-site emotional experience. Although the scenic spots are reopened, tourists' real-time on-site emotional experience does not return to the level before the COVID-19 outbreak, which implies that tourist number recovery and tourist experience recovery may be not synchronous in this sustained global crisis. The findings advance the knowledge about the impact of the COVID-19 pandemic on tourists' real-time on-site emotional experience in the reopened tourism destinations, and point out that tourist experience recovery is an important research issue in the post-pandemic era. Furthermore, results show that holidays, time distance from the Wuhan lockdown and temperature have a positive and significant impact on tourists' emotional experience, which is consistent with the findings of other relevant studies (Zheng et al., 2019; Su et al., 2020).

Our findings yield direct implications for tourist experience management during the COVID-19 pandemic, because the results demonstrate that the destinations reopening does not mean tourists' real-time on-site emotional experience restores to the pre COVID-19 level. Therefore, under the regular pandemic prevention and control measures, destination managers should not only focus on the recovery of tourist arrivals, but also pay attention to the tourist experience recovery. Thus, experience recovery strategies need to be designed separately besides tourist number recovery strategies. First, destinations should not only take pandemic prevention and control measures to prevent infection, but also design spatial-temporal separation between tourist attractions to enhance tourist experience. Second, destinations may introduce new equipment or programs (e.g., virtual experience, interactive shows) to create additional sensorial experiences. Third, compensation strategies such as discounts or exclusive souvenirs can be taken to offset the negative tourism experience caused by the pandemic.

References:

Becken, S. (2013). Measuring the Effect of Weather on Tourism: A Destination- and Activity-Based Analysis. *Journal of Travel Research*, *52*(2), 156–167. https://doi.org/10.1177/0047287512461569

Buckley, R., & Westaway, D. (2020). Mental health rescue effects of women's outdoor tourism: A role in COVID-19 recovery. *Annals of tourism research, 85*, 103041. https://doi.org/10.1016/j.annals.2020.103041

Chinese Center for Disease Control and Prevention. (2018). Standards for the classification of public health emergencies. Retrieved from http://www.chinacdc.cn/jkzt/tfggwssj/gl/201810/t20181015_194984.html Accessed October 14, 2020

Denstadli, J. M., & Jacobsen, J. K. S. (2014). More Clouds on the Horizon? Polar Tourists' Weather Tolerances in the Context of Climate Change. *Scandinavian Journal of Hospitality and Tourism, 14*(1), 80-99. https://doi.org/10.1080/15022250.2014.886096

Goossens, C. (2000). Tourism information and pleasure motivation. *Annals of Tourism Research, 27*(2), 301-321.

https://doi.org/10.1016/S0160-7383(99)00067-5
Jeyanathan, M., Afkhami, S., Smaill, F., Miller, M. S., Lichty, B. D., & Zhou, X. (2020). Immunological considerations for COVID-19 vaccine strategies. *Nature Reviews Immunology, 20*(10), 615-632. https://doi.org/10.1038/s41577-020-00434-6
Li, S., Wang, Y., Xue, J., Zhao, N., & Zhu, T. (2020). The impact of COVID-19 epidemic declaration on psychological consequences: a study on active Weibo users. *International journal of environmental research and public health, 17*(6), 2032. https://doi.org/10.3390/ijerph17062032
Liu, W., Sparks, B., & Coghlan, A. (2016). Measuring customer experience in situ: The link between appraisals, emotions and overall assessments. *International Journal of Hospitality Management, 59*, 42-49. https://doi.org/10.1016/j.ijhm.2016.09.003
Ma, J., Scott, N., Gao, J., & Ding, P. (2017). Delighted or Satisfied? Positive Emotional Responses Derived from Theme Park Experiences. *Journal of Travel & Tourism Marketing, 34*(1), 1-19. https://doi.org/10.1080/10548408.2015.1125824
Matteucci, X. (2016). Tourists' accounts of learning and positive emotions through sensory experiences. *Routledge Advances in Tourism: Positive Tourism*, 54-67
Mcintosh, A. J., & Siggs, A. (2005). An Exploration of the Experiential Nature of Boutique Accommodation. *Journal of Travel Research, 44*(1), 74-81. https://doi.org/10.1177/0047287505276593
McKercher, B., Shoval, N., Park, E., & Kahani, A. (2015). The [Limited] Impact of Weather on Tourist Behavior in an Urban Destination. *Journal of Travel Research, 54*(4), 442–455. https://doi.org/10.1177/0047287514522880
Ministry of Culture and Tourism of the People's Republic of China. (2020). The Ministry of Culture and Tourism has taken various measures to release the potential of consumption recovery. Retrieved from https://www.mct.gov.cn/whzx/whyw/202003/t20200319_851986.htm Accessed October 14, 2020
Moal-Ulvoas, G. (2017). Positive emotions and spirituality in older travelers. *Annals of Tourism Research, 66*, 151-158. https://doi.org/10.1016/j.annals.2017.07.020
Nicola, M., Alsafi, Z., Sohrabi, C., Kerwan, A., Al-Jabir, A., Iosifidis, C.,... Agha, R.

(2020). The socio-economic implications of the coronavirus pandemic (COVID-19): A review. *International Journal of Surgery, 78*, 185-193. https://doi.org/10.1016/j.ijsu.2020.04.018

Polyzos, S., Samitas, A., & Spyridou, A. E. (2020). Tourism demand and the COVID-19 pandemic: An LSTM approach. *Tourism Recreation Research*, 1-13. https://doi.org/10.1080/02508281.2020.1777053

Prayag, G., Hosany, S., & Odeh, K. (2013). The role of tourists' emotional experiences and satisfaction in understanding behavioral intentions. *Journal of Destination Marketing & Management, 2*(2), 118-127. https://doi.org/10.1016/j.jdmm.2013.05.001

Schaller, M., Murray, D. R., & Bangerter, A. (2015). Implications of the behavioural immune system for social behaviour and human health in the modern world. *Philosophical Transactions of the Royal Society B: Biological Sciences, 370*(1669), 1-10. https://doi.org/10.1098/rstb.2014.0105

Slovic, P. (1987). Perception of risk. *Science, 236*(4799), 280-285. https://doi.org/10.1126/science.3563507

Su, B., Ye, Y., Zhang, W., & Lin, M. (2020). Time Course Characteristics of the Public's Psychological Symptoms during Different Stages of the Outbreak of COVID-19. *Journal Of South China Normal University (Social Science Edition), 3*, 79-94. https://kns.cnki.net/kcms/detail/detail.aspx?FileName=HNSB202003009&DbName=CJFQ202.

World Health Organization. (2020). WHO Coronavirus Disease (COVID-19) Dashboard. Retrieved from https://covid19.who.int/ Accessed December 18, 2020

WHO. (2020). COVAX: Working for global equitable access to COVID-19 vaccines. Retrieved from https://www.who.int/initiatives/act-accelerator/covax Accessed November 30, 2020

Yang, Y., Zhang, H., & Chen, X. (2020). Coronavirus pandemic and tourism: Dynamic stochastic general equilibrium modeling of infectious disease outbreak. *Annals of Tourism Research, 83*, 102913. https://doi.org/10.1016/j.annals.2020.102913

Yoosefi Lebni, J., Abbas, J., Moradi, F., Salahshoor, M. R., Chaboksavar, F., Irandoost, S. F.,… Ziapour, A. (2021). How the COVID-19 pandemic effected economic, social, political, and cultural factors: A lesson from Iran. *International Journal of*

Social Psychiatry, 67(3), 298–300. https://doi.org/10.1177/0020764020939984

Zhang, K., Hou, Y., Li, G., & Huang, Y. (2020). Tourists and Air Pollution: How and Why Air Pollution Magnifies Tourists' Suspicion of Service Providers. *Journal of Travel Research, 59*(4), 661–673. https://doi.org/10.1177/0047287519859710

Zhang, Q., & Xu, H. (2020). Understanding aesthetic experiences in nature-based tourism: The important role of tourists' literary associations. *Journal of Destination Marketing & Management, 16*, 100429. https://doi.org/10.1016/j.jdmm.2020.100429

Zheng, S., Wang, J., Sun, C., Zhang, X., & Kahn, M. E. (2019). Air pollution lowers Chinese urbanites' expressed happiness on social media. *Nature Human Behaviour, 3*(3), 237-243. https://doi.org/10.1038/s41562-018-0521-2

Zwanka, R. J., & Buff, C. (2020). COVID-19 Generation: A Conceptual Framework of the Consumer Behavioral Shifts to Be Caused by the COVID-19 Pandemic. *Journal of International Consumer Marketing*, 1-10. https://doi.org/10.1080/08961530.2020.1771646

373

374 Table 1. Summary of distribution of valid Weibo check-in posts

Temporal interval	The volume of Weibo check-in posts	The volume of tourist scenic spots	Summary statistics of monthly Weibo check-in posts of tourist scenic spots				
			mean	median	min	max	sd
2019.11.7-2019.11.30	6,925	197	35.15	28	1	205	30.49
2019.12.1-2019.12.31	11,307	202	55.98	35.5	1	446	61.38
2020.1.1-2020.1.31	12,202	202	60.41	31.5	1	392	73.27
2020.2.1-2020.2.29	5,745	194	29.61	16.5	1	248	40.38
2020.3.1-2020.3.31	12,996	210	61.89	25.5	1	483	83.3
2020.4.1-2020.4.8	6,851	198	34.6	15	1	265	49.05
Total			56,026				

Note: there are 28,259 valid Weibo check-in posts between 2019.11.7 and 2020.1.22, and 27,767 valid Weibo check-in posts between 2020.1.23 and 2020.4.8.

375

376

377

Table 2. Descriptive statistics of variables

Variables	Definition	Mean	Min.	Max.	Std.
SENTIMENT	Median sentiment index in a scenic spot/day level	86.06	0.61	100	21.12
OUTBREAK	A dummy variable equals to 1 if the day is on/after January 23, 2020 (the Wuhan lockdown)	/	0	1	/
RESPONSELEVEL	The response level to the COVID-19 pandemic in a scenic spot on a day, ranging from 0 to 4, with higher value represents more severe the COVID-19 pandemic	/	0	4	/
TIMEDISTANCE	The number of days from January 23, 2020 (the Wuhan lockdown), the value on and before January 23 is 0	/	0	76	/
TEMPERATURE	Temperature in a scenic spot on a day (℃)	12.58	-28	37	9.07
HOLIDAY	A dummy variable equals to 1 if the day is a weekend or a public holiday	/	0	1	/
SPOT	Scenic spot dummies	/	/	/	/

381

382 Table 3. The impact of the COVID-19 outbreak on tourists' real-time on-site emotional experience

	(1)		(2)		(3)	
OUTBREAK	-2.2653***		-5.5677***		-5.7057***	
RESPONSELEVEL		-0.9251***		-1.3295***		-1.1711***
TIMEDISTANCE			0.0605***	0.0273***	0.0730***	0.0303***
HOLIDAY			1.0102***	0.9986**	1.2519***	1.1637***
TEMPERATURE			0.2027***	0.2023***	0.0901***	0.0985***
SPOT					YES	YES
R^2	0.0028	0.0054	0.014	0.015	0.193	0.1922

Note: *p < 0.1, **p < 0.05, ***p < 0.01

383

384

385

386

387

388

389

Table 4. Results of robustness checks (Weibo posts of 183 scenic spots with the complete sample period)

	(1)		(2)		(3)	
OUTBREAK	-2.4577***		-4.8589***		-5.0076***	
RESPONSELEVEL		-0.9342***		-1.23***		-1.0809***
TIMEDISTANCE			0.04***	0.015*	0.0572***	0.0228***
HOLIDAY			0.9246***	0.9526***	1.1729***	1.127***
TEMPERATURE			0.214***	0.2138***	0.0958***	0.1042***
SPOT					YES	YES
R^2	0.0033	0.0055	0.0137	0.015	0.198	0.1976

Note: *p < 0.1, **p < 0.05, ***p < 0.01

Table 5. Results of robustness checks (Baidu: all Weibo posts)

	(1)		(2)		(3)	
OUTBREAK	-4.9736***		-10.7762***		-11.1277***	
RESPONSELEVEL		-1.7032***		-2.3593***		-2.5060***
TIMEDISTANCE			0.1292***	0.0576***	0.1242***	0.0522***
HOLIDAY			1.9203***	1.8453***	2.1476***	2.0850***
TEMPERATURE			0.0872***	0.0945***	0.1357***	0.1497***
SPOT					YES	YES
R^2	0.0123	0.0164	0.0238	0.0227	0.0945	0.0941

Note: *p < 0.1, **p < 0.05, ***p < 0.01

Table 6. Results of robustness checks (Tencent: Weibo posts without opposite sentiment tendencies)

	(1)		(2)		(3)	
OUTBREAK	-2.3982***		-5.3050***		-5.5689***	
RESPONSELEVEL		-0.8928***		-1.2496***		-1.2065***
TIMEDISTANCE			0.0570***	0.0252***	0.0649***	0.0266***
HOLIDAY			1.0383***	1.0377**	1.3031***	1.2582***
TEMPERATURE			0.1375***	0.1399***	0.0929***	0.1022***
SPOT					YES	YES
R^2	0.0046	0.0073	0.0143	0.0151	0.1198	0.119

Note: *p < 0.1, **p < 0.05, ***p < 0.01

411 Table 7. Results of robustness checks (Baidu: Weibo posts without opposite sentiment tendencies)

	(1)		(2)		(3)	
OUTBREAK	-2.7297***		-6.4153***		-6.8146***	
RESPONSELEVEL		-0.9633***		-1.3970***		-1.4908***
TIMEDISTANCE			0.0780***	0.0348***	0.0798***	0.0335***
HOLIDAY			1.2891***	1.2466***	1.5285***	1.4790***
TEMPERATURE			0.0962***	0.1008***	0.1043***	0.1150***
SPOT					YES	YES
R^2	0.0056	0.0079	0.0143	0.0136	0.0732	0.0724

Note: *p < 0.1, **p < 0.05, ***p < 0.01

412

413